# PIC C Compiler

**This C compiler, is fully optimised for use with PIC microcontrollers. Built in functions make coding the software very easy. Based on original K&R, the integrated C development environment gives developers a fast method to produce efficient code from an easily maintainable high level language.**

### CAPABILITIES

- Arrays up to 5 subscripts
- Structures and Unions may be nested.
- Custom bit fields (1-8 bits) within structures.
- ENUMurated types,
- CONSTant variables, arrays and strings.
- Full function parameter support (any number).
- Some support for C++ reference parameters.

### STANDARD C FUNCTIONS:

- IF, ELSE, WHILE, DO, SWITCH, CASE, FOR, RETURN, GOTO, BREAK, CONTINUE
- !, ~, ++, --, *, /, %, +, -, <<, >>, <. <=, >, >=, ==, !=, &, ^, |, &&, ||, ?:, =, +=, -=, *=, /=, %=, >>=, <<=, &=, ^=, |=
- TYPEDEF, STATIC, AUTO, CONST, ENUM, STRUCT, UNION

- Built in Libraries for RS232 serial I/O library, I/O, $I^2C$, discrete I/Oand precision delays.
- Integrates with MPLAB and other simulators/emulators for source level debugging.
- Standard Hex file and debug files ensure compatibility with all programmers.
- Formatted Printf allows easy formatting and display in Hex or decimal.
- Efficient function implementation allows call trees deeper than the hardware stack.
- Access to hardware from easy to use C functions, Timers, A/D, E2, SSP, PSP, I2C & more.
- 1,8, and 16 bit types.
- Assembly code may be inserted anywhere in source and may reference C variables.
- Automatic linking handles multiple code pages.
- Inline procedures supported; Linker automatically determines optimum architecture or it can be manually specified.
- Compiler directives determine if tri-state registers are refreshed on every I/O
- Constants (including strings and arrays) are saved in program memory.
- Standard one bit type (Short Int) permits the compiler to generate efficient Bit oriented code.
- #BIT and #BYTE allow C variables to be placed at absolute addresses to map register to C variables.
- Reference parameters may be used to improve code readability and inline procedure efficiency.
- Both an Integrated editor/compiler and a cmd line compiler.
- Special windows show the RAM memory map, C/Assembly listing and the calling tree.
- Interrupt procedures supported on PCM. The compiler generates all startup and cleanup code as well as identifying the correct interrupt procedure to be called.
- Updates via modem for 30 days included.

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# PIC C Compiler

## Description

This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The compiler includes built in functions to access the PIC hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PRAGMA. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure in C. The microcontroller clock speed may be specified in a PRAGMA to permit built in functions to delay for a given number of microseconds or milliseconds.
Serial I/O functions allow standard functions such as GETC and PRINTF to be used for RS-232 like I/O. The hardware serial transceiver is used for applicable parts when possible. For all other cases a software serial transceiver is generated by the compiler. The standard C operators and the special built in functions are optimised to produce very efficient code for the bit and I/O functions. Functions may be implemented inline or separate. Function parameters are passed in reusable registers.
Inline functions with reference parameters are implemented efficiently with no memory overhead. During the linking process the program structure including the call tree is analysed. Functions that call one another frequently are grouped together in the same page. Calls across pages are handled automatically by the tool transparent to the user. Functions may be implemented inline or separate. RAM is allocated efficiently by using the call tree to determine how locations can be re-used. Constant strings and tables are saved in the device ROM. The output hex and debug files are selectable and compatible with popular emulators & programmers including MPLAB for source level debugging. The Professional Package (PCW) provides both compilers in a powerful Windows environment.

| Feature | CCS-PCB | CCS-PCM | CCS-PCW |
|---|---|---|---|
| 12 bit PICs (PIC12C50X & 16C5X) | X | | X |
| 14 bit PICs (PIC16c61 - 84) | | X | X |
| Built in Functions | X | X | X |
| Example Programs | X | X | X |
| Device Drivers | X | X | X |
| Extra Optimization | | | X |
| MPLAB Interface | X | X | X |
| Professional Editor | | | X |
| Device Editor | | | X |
| Hex Dissassembler | | | X |
| New Project Starter | | | X |
| Call Tree Window | X | X | X |
| Statistics Window | | | X |

## Part Numbering and Pricing

| Description | Part No | Price |
|---|---|---|
| PCB Compiler for PIC16C52-58 | CCS-PCB | £99.00 |
| PCM Compiler for PIC16C61-84 | CCS-PCM | £99.00 |
| PCW Professional Package (Windows IDE with PCB & PCM) | CCS-PCW | £299.00 |

| Maintenance | 30 day update rights Included |
|---|---|
| PCB or PCM Maintenance | £66.00 |
| PCW Maintenance | £135.00 |
| Monthly Email updates | £15.00 |

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## Built In Functions

**DELAYS**
DELAY_US
DELAY_MS
DELAY_CYCLES
**RS232 I/O**
GETCH
PUTCHAR
KBHIT
ETS
PUTS
PRINTF
GETCHAR
PUTC
**I2C I/O**
I2C_START
I2C_STOP
I2C_WRITE
I2C_READ
I2C_POLL
**DISCRETE I/O**
OUTPUT_HIGH
OUTPUT_FLOAT
OUTPUT_BIT
INPUT
SET_UART_SPEED
SET_TRIS_x
OUTPUT_LOW
PORT_B_PULLUPS
**BIT MANIPULATIONS**
SHIFT_LEFT
SHIFT_RIGHT
ROTATE_LEFT
ROTATE_RIGHT
BIT_SET
BIT_CLEAR BIT_TEST
SWAP
**STANDARD C**
MEMCPY
MEMSET
STRCPY
ISALNUM
ISALPHA
ISDIGIT
ISLOWER
ISUPPER
ISSPACE
ISXDIGIT
TOUPPER
TOLOWER
READ_BANK
WRITE_BANK
**92xx LCD**
SETUP_LCD
LCD_LOAD

**STR**
CHAR STRCAT
CHAR STRCHR
CHAR STRRCHR
INT STRCMP
INT STRNCMP
INT STRICMP
CHAR * STRNCPY
INT STRCSPN
INT STRSPN
INT STRLEN
CHAR *STRLWR
CHAR * STRPBRK
CHAR *STRSTR
CHAR STRTOK
**STANDARD C**
#PRAGMA
#DEFINE
#UNDEF
#INCLUDE
#IF
#IFDEF
#IFNDEF
#ELSE
#ENDIF
#ERROR
#NOLIST
#LIST
**DEVICE SPECIFICATION**
#DEVICE
#FUSES
#ID
**FUNCTION QUALIFIER**
#INLINE
#SEPARATE
#INT_xxxx
INT_GLOBAL
INT_DEFAULT
**BUILT-IN LIBRARIES**
#USE
#USE STANDARD_IO
#USE FAST_IO
#USE FIXED_IO
#USE DELAY
#USE RS232
#USE I2C
**MEMORY CONTROL**
#BIT
#BYTE
#ASM
#ENDASM
#ROM
#ZERO_RAM
#RESERVE

**COMPILER CONTROL**
#CASE
#PRIORITY
#OPT
**PRE_DEFINED IDENTIFIER**
__PCB__
__PCM__
__DEVICE__
__DATE__

**TIMERS /COUNTERS**
SETUP_COUNTERS GET_RTCC
GET_TIMER0
GET_TIMER1
GET_TIMER2
SET_RTCC
SET_TIMER0
SET_TIMER1
SET_TIMER2
SETUP_TIMER1
SETUP_TIMER2
RESTART_WDT
**CCP**
SETUP_CCP1
SETUP_CCP2
SETUP_PWM_DUTY
SETUP_COMPARATOR
**VREF**
SETUP_VREF
**INTERNAL EEPROM**
READ_EEPROM
WRITE_EEPROM
**A/D INPUT**
SETUP_PORT_A
SETUP_ADC
SET_ADC_CHANNEL
READ_ADC
**PROCESSOR CONTROL**
ENABLE_INTERRUPTS
DISABLE_INTERRUPS
EXT_INT_EDGE
**PSP PARALLEL I/O**
PSP_OUTPUT_FULL
PSP_INPUT_FULL
PSP_OVERFLOW
SETUP_PSP
**SPI 2 WIRE I/O**
SETUP_SPI
SPI_DATA_IS_IN
SPI_WRITE
SPI_READ
**PROCESSOR CONTROL**
SLEEP
RESTART_CAUSE

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## Example Program

```
////////////////////////////////////////////////////////////////////////////
/
////                    EX_STEP.C                              ////
////
          ////
////  This program interfaces to a stepper motor.    ////
////  The program will use the RS-232 interface to  ////
////  either control the motor with an analog          ////
////  input, a switch input or by RS-232 command. ////
////////////////////////////////////////////////////////////////////////////
/

#include <16C71.H>
#use Delay(Clock=20000000)
#use RS232(Baud=9600,Xmit=PIN_A3,Rcv=PIN_A2)
#byte port_b = 6
#define FOUR_PHASE TRUE
#ifdef FOUR_PHASE

byte const POSITIONS[4] = {0b0101,
                           0b1001,
                           0b1010,
                           0b0110};
#else
byte const POSITIONS[8] = {0b0101,
                           0b0001,
                           0b1001,
                           0b1000,
                           0b1010,
                           0b0010,
                           0b0110,
                           0b0100};
#endif

drive_stepper(byte speed, char dir, byte steps) {
   static byte stepper_state = 0;
   byte i;

   for(i=0;i0x80)
      drive_stepper(128-(value-128),'F',8);
      delay_ms(100);

use_switch(byte speed, char dir) {

   byte steps;

   printf("\n\rSteps per press: ");
   steps = gethex();

   while(true) {
      while(input(pin_13)) ;
      drive_stepper(speed,dir,steps);
      while(!input(pin_13)) ;main() {

   byte speed,steps;
   char dir;

   setup_port_a(RA0_RA1_ANALOG);

   while (TRUE) {
      printf("\n\rSpeed (hex): ");
      speed = gethex();

      if(speed==0)
         use_pot();

      printf("\n\rDirection (F,R): ");
      dir=getc()|0x20;

      printf("\n\rSteps (hex): ");
      steps = gethex();

      if(steps==0)
         use_switch(speed,dir);

      drive_stepper(speed,dir,steps);
   }

}
```

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